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Diseases, Insects, Pests

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Scald and Net Blotch of Barley

Cultural and Chemical Control

Diseases caused by fungi, bacteria, viruses and nutrient disorders can significantly reduce barley yield and quality between seeding and harvest. Diseases caused by fungi, particularly fungal leaf diseases are generally most destructive in the cooler, wetter areas of Alberta.

Barley leaf diseases of significant importance are listed in table 1. Diseases of less importance not included in the table are aster yellows, bacterial blight (black chaff, streak), halo spot, spot blotch, leaf rust, herbicide injuries and physiological leaf spots. Flame chlorosis has not been found in Alberta.

Leaf diseases that are the most important in yield and quality loss are scald and net blotch (table 2). Both fungi overwinter on barley stubble and usually occur together. Scald is the major disease found in the cooler, wetter regions of western and northern Alberta, while net blotch predominates in the central and southern regions of the province. Septoria complex, viral and fungal stripe, gray speck and barley yellow dwarf virus usually cause losses of less economic significance.

Disease descriptions

The scald fungus (*Rhynchosporium secalis*) is easily identified by the distinctive oval blotches that show up on barley leaves. These blotches first appear water-soaked. Later they turn light grey and are edged by distinctive dark brown margins.

The net blotch fungus (*Pyrenophora teres*) causes brown leaf patches which develop a netted appearance. However, some strains of the fungus produce round brown spots rather than the net-like blotches.

During moist spring weather, both fungi produce infectious spores on diseased barley stubble. The spores are spread by wind and rain to infect the current season's crop. Cool, wet, humid growing conditions favor the development of both diseases. Seed infection occurs but it is not regarded as an important factor in major disease outbreaks. Both disease organisms overwinter on crop residue and may survive for one to two years.

The publication, *Diseases of Field Crops in Canada*, contains excellent color photographs of these diseases and as well as further detailed information.

Table 1. Leaf diseases of barley in Alberta and current control methods

Disease	Rotation (R)	Certified seed (C)	Genetic resistance (G)	Seed treatment (ST) Foliar fungicide (F)
Net blotch	R	–	G	F
Scald	R	–	G	F
Septoria complex (speckled leaf blotch)	R	–	G	–
Fungus stripe	–	C	G	ST
Gray speck (manganese deficiency)	–	–	–	–
Virus stripe	–	C	–	–
Barley yellow dwarf virus	–	–	–	–

Copies of this and related publications may be obtained from the Print Media Branch, Alberta Agriculture, 7000 - 113 Street, Edmonton, Alberta T6H 5T6 or Alberta Agriculture's District Offices.

Consequences of infection by scald and net blotch

Scald and net blotch infections reduce the photosynthetic area of the barley plant, thus reducing the plant's ability to manufacture sugars and starches. In summers with prolonged wet weather during late June and early July, leaf diseases can build and reduce crop yields by up to 50 per cent when barley is grown after barley. A fungicide such as Tilt is designed to prevent or reduce this leaf damage, so that the kernels achieve full size and the barley crop can reach its yield potential. Late season infections on the barley leaves in late August/September have little effect on grain yield or quality.

Disease management

Plant disease development depends on three factors:

- The presence and abundance of the disease organism,
- Suitable environmental conditions for infection and reproduction of the disease organism,
- A susceptible host crop.

All three of these factors must be managed to reduce disease severity. Effective disease management usually requires a combination of practices that focus on all of these factors.

Table 2. Barley cultivar reaction to scald and net blotch

		Scald			Net Blotch			Field
		Sus	Int	Res	Sus	Int	Res	Ratings*
Most susceptible								
Abee	(2-row feed)	X			X			4
Bridge	(2-row feed)	X			X			–
Deuce	(2-row feed)	X			X			3
Winthrop	(2-row feed)	X			X			–
Jackson	(6-row feed)	X			X			1
Noble	(6-row feed)	X			X			5
Otal	(6-row feed)	X			X			4
Samson	(6-row semi-dwarf)	X			X			5
Condor	(2-row hull-less)	X			X			7
CDC Buck	(6-row hull-less)	X			X			–
Harrington	(2-row malt)	X			X			3
Klages	(2-row malt)	X			X			5
Stein	(2-row malt)	X			X			–
B1602	(6-row malt)	X			X			–
Argyle	(6-row malt)	X			X			5
Bonanza	(6-row malt)	X			X			5
Creme	(6-row malt)	X			X			–
Duel	(6-row malt)	X			X			–
Moderately susceptible								
Galt	(6-row feed)		X		X			5
Heartland	(6-row feed)	X				X		4
Johnston	(6-row feed)			X	X			7
Virden	(6-row feed)	X				X		7
Duke	(6-row semi-dwarf)			X	X			7
CDC Richard	(2-row hull-less)			X	X			–
Manley	(2-row malt)	X				X		–
Least susceptible								
AC-Stacey	(6-row feed)			X		X		–
Brier	(6-row feed)		X			X		–
Leduc	(6-row feed)			X		X		8
Winchester	(6-row semi-dwarf)			X		X		8

Sus = Susceptible to infection, moderate to severe disease levels. Int = Intermediate-susceptibilty to light disease levels. Res = Resistant to the disease. These ratings are based on greenhouse tests. *Overall disease ratings were established under field conditions at several sites in Alberta. The ratings are on a 1 to 9 scale; 9 is excellent disease resistance and 1 is very poor resistance. The greenhouse tests with a few exceptions are generally in agreement with the field discountings.

Environmental conditions

Moisture is the key factor in the development of both scald and net blotch. Rains and heavy dews provide ideal conditions for infection. Heavy crops provide an excellent microclimate for these diseases. The scald fungus is dispersed by rain splash and its spread onto the upper leaves of the plant is favored by heavy rain showers. The net blotch organism is wind dispersed and requires dry conditions for optimal spore dispersal. With the exception of irrigated crops there are few options for controlling environmental conditions. Disease severity will be generally higher in those crops that have been heavily fertilized due to the production of a denser crop canopy that retains moisture on the leaves for a longer period of time.

Plant resistance

Growing resistant cultivars is probably the most appealing of management options. However, not all cultivars provide high levels of resistance to both scald and net blotch, and those that do may not meet some of the agronomic requirements that are needed by a producer. At present, genetic resistance to scald and net blotch is absent in many of the recommended varieties of barley (table 2). Furthermore, new strains of the net blotch and scald fungi continue to evolve and previously resistant barleys eventually become susceptible. Therefore, it is important to monitor the disease resistance performance of a variety. If a susceptible variety is to be grown, do so in a field where the previous crop was not barley. In subsequent years, if barley is to be grown in this field, plant a variety that has good disease resistance.

Disease organism

Even if a susceptible variety is grown, a disease problem will only occur if the disease organism is present. Unfortunately, both scald and net blotch fungi can be found throughout most of Alberta. The presence and abundance of these organisms will depend upon the agronomic practices that have been followed for barley production.

Cultural practices

Because both diseases survive on crop residues, tillage practices that incorporate the residue and aid in the breakdown of the residue will reduce the abundance of the disease organism. The disease risk reduction must be balanced against the increased soil erosion potential. Crop rotation is an effective management tool. Rotating out of barley for one year will significantly reduce the potential for serious disease problems; although two years would be better. It is important to control volunteer barley during the intervening years to ensure the full benefits from growing a non-host crop are obtained.

A small percentage of seed may carry scald and net blotch and in this manner the disease may be introduced into a clean field. The disease that develops from infected seed will not likely develop to levels at which they would cause significant yield losses; however, it would contribute to the distribution and establishment of the disease in the field, which can become a problem in the following year. Using seed grown from a field where the disease was not a problem will reduce the chances of introducing the disease in this manner; although this option may not always be available. Furthermore, despite these precautions, wind dispersal of the fungal spores may introduce the disease from nearby fields.

Foliar fungicides

In Western Europe, foliar fungicides are used extensively on cereals for disease control. These fungicides may be applied as often as three or four times a season on barley (winter and spring types) to maintain yield and grain quality. Subsidized grain prices make this practice economical to follow.

In Canada, lower barley prices make application of foliar fungicides feasible only in those areas where the disease potential is high or in regions with high yield or quality expectations.

Tilt (propiconazole) is the only fungicide available in Canada that is effective for the control of net blotch and scald. As of 1992, this fungicide has a full registration for ground and aerial application for foliar disease control on all wheats and barleys. Restrictions on the use of treated straw for livestock bedding and feed have been removed.

When to use a foliar fungicide

The use of a foliar fungicide on barley should only be considered by those growers living in wetter regions of Alberta who:

- grow barley for pedigreed seed,
- produce malting barley,
- expect yields over 80 bushels per acre.

Higher foliar disease levels in the barley crop usually coincide with the higher rainfall areas. Fungal diseases such as scald and net blotch will only spread from leaf to leaf during prolonged wet weather. Wet weather conditions or nights with heavy dew from mid-June to mid-July result in the highest incidence of leaf infections. Drought or drying weather during this time results in a lowered incidence of diseases with less effect on yield or quality. In reality, good growing weather is also good disease weather.

What does Tilt do?

Tilt protects the crop for three or four weeks and works by stalling the development of foliar disease.

In a sprayed versus unsprayed crop of barley the numbers of kernels and heads will be similar, but kernel weight and therefore yield will increase considerably if foliar diseases are controlled. Higher yields, resulting from increased kernel weight, enhance the feeding value of barley and improve the chances of obtaining malting grade or pedigreed seed status owing to better germination, vigor and visual appearance.

Tilt is applied by air in 40-50 L/ha of water or by ground in 200 L/ha of water. Tilt is applied during the early boot stage prior to heading, between 37-49 on the Zadoks scale, when 5-10 per cent of the surface of lower leaves are damaged by disease infection.

What kind of yield or quality increases can you expect?

The yield of a barley crop is determined by the number of kernels per head, weight of the kernel, and heads per unit area; these yield components can be affected by the length of growing season, seeding depth, weed control, weed competition, evaporation rate, soil fertility, moisture availability, cultivar type and insect infestations.

Under conditions of high fertility and high disease potential yield increases of up to 25 bu/acre have been recorded with a single application of Tilt. The increase in yield, kernel plumpness and quality certainly increases the malting grade potential of the crop.

What kind of returns should you expect?

The application cost of using Tilt is approximately $15-16 per acre, which includes $12 per acre for the chemical. If barley is priced at $2 per bushel, then a minimum yield increase of 8 bushels per acre is required in order to breakeven. This does not account for increased kernel weight, malting potential or seed quality.

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